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AUTHOR Bottoms, Gene; Presson, Alice
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ABSTRACT

A study examined the following questions to ascertain what progress has been made in improving the educational achievement of vocational students through the "High Schools That Work" initiative: (1) What progress has been made in raising the achievement of vocational students to national averages or higher? (2) What things matter in raising student achievement? and (3) What actions can states take to improve high schools for students in vocational programs? The study found that vocational students in "High Schools That Work" exceeded the national averages of vocational students in reading, mathematics, and science achievement. The study also found that these things (among others) mattered in raising student achievement: a challenging curriculum, increased graduation requirements, mathematics and science course requirements for senior year, vocational teachers stressing academic knowledge and skills, high teacher expectations of students, student guidance, students meeting curriculum and achievement goals, and demanding standards for technical achievement. Finally, to improve high schools for vocational students, the study found that states can require all students to complete at least the "High Schools That Work"-recommended curriculum to graduate; create accountability standards for schools to increase the number of students reaching curriculum and achievement goals; improve vocational student evaluation methods; improve vocational teacher preparation; require schools to provide students early and ongoing advice about postsecondary career and educational options; provide funding for schools to offer summer programs and before/after school programs to help students reach high standards; and establish teams of experts to assist low-performing schools. (KC)

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SREB

# *Using Lessons Learned:*

# Improving the Academic Achievement of Vocational Students

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(404) 875-9211
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# Goals for Education: Challenge 2000

BY THE YEAR 2000—

*All children will be ready for first grade.*

*Student achievement for elementary and secondary students will be at national levels or higher.*

*The school dropout rate will be reduced by one-half.*

*90 percent of adults will have a high school diploma or its equivalent.*

*Four of every five students entering college will be ready to begin college-level work.*

*Significant gains will be achieved in the mathematics, sciences and communications competencies of vocational education students.*

*The percentage of adults who have attended college or earned two-year, four-year and graduate degrees will be at the national averages or higher.*

*The quality and effectiveness of all colleges and universities will be regularly assessed, with particular emphasis on the performance of undergraduate students.*

*All institutions that prepare teachers will have effective teacher-education programs that place primary emphasis on the knowledge and performance of graduates.*

*All states and localities will have schools with improved performance and productivity demonstrated by results.*

*Salaries for teachers and faculty will be competitive in the marketplace, will reach important benchmarks and will be linked to performance measures and standards.*

*States will maintain or increase the proportion of state tax dollars for schools and colleges while emphasizing funding aimed at raising quality and productivity.*

The SREB Commission for Educational Quality, 1988

# VOCATIONAL EDUCATION

**BY THE YEAR 2000—**

***Significant gains will be achieved in the mathematics, sciences and communications competencies of vocational education students.***

*SREB Goals for Education*, 1988

- What progress has been made in raising the achievement of vocational students to national averages or higher?
- What things matter in raising student achievement?
- What actions can states take to improve high schools for students in vocational programs?

## What progress has been made in raising the achievement of vocational students to national averages or higher?

Considerable. SREB's unwavering commitment to higher standards and greater achievement has brought substantial gains in the performance of a large group of high school students who in 1988 were overlooked and underserved. SREB's *High Schools That Work* — a school improvement initiative that is nationally acclaimed for showing results — can document achievement gains by vocational students.

Using data from exams based on the National Assessment of Educational Progress, SREB has determined that *High Schools That Work* sites that participated in the 1996 and 1998 assessments have met the 1988 goal to raise the mathematics and science achievement of vocational students to the national averages of all high school students.

Reading achievement remains a problem for vocational students as high schools strive to deliver college-preparatory-level content to all students, not just to students planning to enter four-year colleges and universities. Many schools still have multiple levels of English courses in which they place students according to preconceived notions of who can learn and who cannot and who needs high-level English content and who does not.

A remaining challenge is to close the achievement gap between African-American students and white students. Even if African-American students take college-preparatory-level English, mathematics and science courses, these students do not score as well as white students on the NAEP-based exams. The quality of instruction and the standards to which students are held are key causes for this gap in achievement.

## What things matter in raising student achievement?

By working with a network of high schools in all 16 SREB states and collecting data on their progress, SREB has identified the school and classroom practices that "matter" in raising student achievement.

It matters that:

- students complete a challenging curriculum;
- districts and states increase graduation requirements;
- students take a mathematics course and a science course in their senior year;
- vocational teachers stress academic knowledge and skills;
- teachers set high expectations and make assignments that engage students;
- students receive guidance and advisement;
- students meet curriculum and achievement goals; and
- vocational students are held to demanding standards for technical achievement.

Vocational students are achieving at a higher level now than 12 years ago because schools have raised curriculum and instructional standards and adopted a new attitude that all students can learn if the conditions are right and the support is available. In more than a decade of progress, SREB has seen a doubling in the percentage of vocational students who complete more high-level academic courses, thus gaining a solid foundation for whatever pathway they follow immediately after high school — whether it be postsecondary education, a job or both.

Several years ago SREB introduced the Award of Educational Achievement that is presented to graduating seniors who meet *High Schools That Work*'s curriculum and achievement goals. This award has proven to be a predictor of future success in the workplace and higher education and is serving as an incentive for students to work harder in high school. The simple act of receiving a certificate — with all that it signifies — has inspired students and their parents to set more ambitious goals for high school and beyond. If the number of students who earn the award grows each year, the benefits to the states in improved productivity and earnings could increase significantly.

SREB is making progress in *High Schools That Work* and is working closely with states to incorporate the lessons learned from the *HSTW* initiative into state policies and school practices. For example, 10 states are requiring or encouraging schools to require the *HSTW* mathematics curriculum, and six states require or promote the *HSTW* science curriculum. No state has taken steps in this direction for language arts — the area in which many students need the most help.

SREB's challenge is to continue working with states, districts and schools to take the lessons learned from this comprehensive school-improvement effort to help inform state and local policy and leadership initiatives that can improve students' academic and technical achievement.

Mark Musick
SREB President



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# *Using Lessons Learned:*
# Improving the Academic Achievement of Vocational Students

State and local leaders create the conditions and policies that support schools' actions to improve student achievement. In efforts to raise the academic achievement of vocational students, leaders can call on the lessons learned from SREB's *High Schools That Work*. This report will examine three basic questions:

- What progress has been made in raising the achievement of vocational students to national averages or higher?
- What things matter in raising student achievement?
- What actions can states take to improve high schools for students in vocational programs?

Since 1987 the Southern Regional Education Board has joined with states and schools to bring about significant gains in the reading, mathematics and science achievement of high school students who complete a concentration of courses in vocational studies. To raise academic achievement, participating schools become part of a comprehensive school-improvement effort. The emphasis is on raising expectations; getting vocational students to complete a core of advanced-level academic courses and a career/technical concentration of courses; teaching in ways that motivate these students to learn challenging content; involving parents in the advisement process; and using data to guide improvement efforts.

## *What progress has been made in raising the achievement of vocational students to national averages or higher?*

SREB established several indicators for following schools' progress in advancing the academic achievement of vocational students. Based on these indicators, all SREB states are making some progress. Most states have made more progress in mathematics and science than in reading. Overall, the academic achievement of vocational students has improved — as measured by *HSTW* tests based on the National Assessment of Educational Progress. More students are meeting achievement goals, and more schools are posting better scores. The decade-long focus on vocational students is making a difference, but states need to increase their efforts to get 85 percent of these students to achieve at a level required for further learning in the workplace and in colleges and universities.

This report was prepared by Gene Bottoms, SREB senior vice president and founding director of *High Schools That Work*, and Alice Presson, director of research and evaluation for *High Schools That Work*.

## Vocational students in *High Schools That Work* reaching the national averages of achievement for all students

In 1998, students from schools that had participated in *High Schools That Work* for at least two years reached the national averages for all high school students in mathematics and science. While progress has been made in reading, mathematics and science, there still is a gap in reading achievement. (See Table 1.)

*HSTW* students in only three SREB states (Florida, North Carolina and Texas) had average scores at the national average or higher in reading. SREB states fared better in mathematics and science. Students in 10 SREB states (Arkansas, Delaware, Florida, Georgia, Kentucky, North Carolina, Oklahoma, South Carolina, Texas and Virginia) reached the national average in mathematics. Students in half of the SREB states (Arkansas, Florida, Kentucky, North Carolina, Oklahoma, South Carolina, Texas and Virginia) reached the national average in science.

## Vocational students in *High Schools That Work* reaching the national averages of vocational students

In 1998 students enrolled in vocational studies at *HSTW* sites exceeded the national averages of vocational students in reading, mathematics and science achievement. The average reading score of *HSTW* students was 10 points higher than the national average of vocational students. Their average mathematics score was 22 points higher and their average science score was 25 points higher.

Table 1
**Average scores for *HSTW* students compared with national averages for all high school students**

| | *HSTW* sites | All high school students |
|---|---|---|
| Reading | 277 | 287 |
| Mathematics | 299 | 299 |
| Science | 292 | 293 |

Sources: The data from *HSTW* sites are taken from the *High Schools That Work* Assessment (based on the National Assessment of Educational Progress) of 12th-graders who completed three or four credits in a planned sequence of vocational courses at 444 high schools. The national averages for all students are taken from a national sample of results on the 12th-grade NAEP assessment.



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Table 2
**Percent of students who met the *HSTW* achievement goals**

| | Reading | Mathematics | Science |
|---|---|---|---|
| 1994 | 33% | 34% | 39% |
| 1998 | 51 | 58 | 53 |

## Reaching the *HSTW* achievement goals

The *HSTW* achievement goals in reading, mathematics and science give schools and states a target in their efforts to prepare vocational students academically and technically for further study and jobs. These goals are linked to levels of proficiency set for the National Assessment of Educational Progress. (See the sidebar on page 9.) *HSTW* students who meet all *HSTW* achievement goals have higher average NAEP scores than do students nationwide who plan to attend college. **For each subject, the proportion of *HSTW* students who met the achievement goal increased from about one-third to about one-half between 1994 and 1998. (See Table 2.)**

## Seeking higher levels of achievement

The "proficient" and "advanced" levels are NAEP's highest levels of proficiency. The national average scores of college-preparatory students in reading, mathematics and science are at the proficient level. Students who score below the NAEP "basic" level have minimum skills in reading, mathematics and science. Their scores show that they have not mastered secondary-level work and certainly lack the skills for college work. The good news is that there has been a decline in the percentage of vocational students at *HSTW* sites who score below basic in mathematics and science on the NAEP-based *HSTW* Assessment. In 1998, only 5 percent scored below basic in mathematics and only 8 percent scored below basic in science. Vocational students' greatest weakness is in reading: Thirty-six percent scored below basic in reading in 1998.

## Increasing the number of improving schools

The number and percentage of schools posting improved scores on the NAEP-based *HSTW* Assessment increased dramatically from 1996 to 1998, compared with growth from 1994 to 1996. (See Table 3.)



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## Meeting *HSTW* Achievement Goals: What Students Know and Can Do

### Reading (279)

The current reading goal corresponds to NAEP's "basic" level of performance, a standard for partial mastery that is lower than the "proficient" standard. The long-range intent is to increase the goal to the "proficient" level. At the "basic" level, students can, among other things:

- seek and use information from manuals, journals, periodicals and other documents;
- use information from several sources to make interpretations, draw conclusions and identify and solve stated problems; and
- recognize limitations in available information.

### Mathematics (295)

The mathematics goal corresponds to NAEP's "proficient" level of performance, a standard for mastery of challenging subject matter. Students can, among other things:

- understand concepts from algebra, geometry and probability;
- apply concepts from algebra, geometry and probability in solving multistep problems; and
- explain reasoning in various problem-solving situations.

### Science (292)

The science goal corresponds to NAEP's "proficient" level of performance, a standard for mastery of challenging subject matter. Students can, among other things:

- apply knowledge, skills and reasoning to interpret scientific and technical data from tables;
- make inferences about outcomes of experimental procedures;
- evaluate the appropriateness of an experiment's design; and
- interpret scientific text and graphs.

Table 3

**Percent of *HSTW* schools with increased scores between 1994 and 1996 and between 1996 and 1998**

| | Number of schools | Percent of schools with increases in scores | | |
|---|---|---|---|---|
| | | Reading | Mathematics | Science |
| 1994 to 1996 | 260 | 49% | 60% | 53% |
| 1996 to 1998 | 444 | 63 | 85 | 82 |

## Increasing the achievement of African-American students

States and schools in SREB states face a challenge in helping African-American students who are completing vocational studies to meet higher achievement standards. While these students' achievement has improved in all three areas (reading, mathematics and science), a major gap exists between the achievement of African-American students and of white students. (See Table 4.) The widest gap is in science. Among vocational students, about the same percentages of African-American students and white students complete college-preparatory English, mathematics and science courses, but the achievement levels are not the same. Based on visits to hundreds of high schools in the last 10 years and on data from the *HSTW* Assessment during that period, SREB has concluded that two key reasons for the disparity are the quality of instruction and the standards to which African-American students are held.

Some states are using end-of-course exams linked to a comprehensive accountability system to improve instruction and raise standards for all students. Such exams may help reduce

Table 4

**Percent of African-American students and white students meeting *HSTW* achievement goals in 1998**

| | African-American students | White students |
|---|---|---|
| Reading | 35% | 55% |
| Mathematics | 36 | 63 |
| Science | 30 | 60 |

the achievement gap between African-American students and white students. In North Carolina — a state that has given end-of-course exams since 1986 — more than half of the African-American students who participated in the 1998 *HSTW* Assessment met the *HSTW* goals in reading and mathematics. In all SREB states, about one-third of the African-American students who took the assessment met these goals. North Carolina's African-American students also scored significantly higher in reading, mathematics and science than African-American students at *HSTW* sites in other states.

## *What things matter in raising student achievement?*

By working directly with schools since 1988 and with a continuous data-collection system, SREB has identified school practices that help improve academic achievement and that distinguish high achievement from low achievement. It matters that:

- students complete a challenging curriculum;
- districts and states increase graduation requirements;
- students take a mathematics course and a science course in their senior year;
- vocational teachers stress academic knowledge and skills;
- teachers set high expectations and make assignments that engage students;
- students receive guidance and advisement;
- students meet curriculum and achievement goals; and
- vocational students are held to demanding standards for technical achievement.

### The *HSTW*-recommended curriculum

- four credits in English courses with content and achievement standards comparable to college-preparatory/honors courses
- three credits in mathematics courses, including two credits in courses with content and achievement standards comparable to college-preparatory Algebra I, geometry or Algebra II
- three credits in science, including two credits in courses with content and achievement standards comparable to college-preparatory biology, chemistry, physics or applied physics
- four credits in a planned sequence of career and technical studies and two related credits, including computer literacy skills

## 1. It matters that students complete a challenging curriculum.

For states to increase significantly vocational students' achievement in reading, mathematics and science, these students will need to complete more challenging courses. States need to establish policies that encourage students to complete such courses. Students who complete challenging English, mathematics and science courses score higher on achievement tests and are more likely than other students to succeed in college and the workplace, according to studies of *HSTW* sites by MPR Associates Inc. (for the National Center for Research in Vocational Education) and by Research Triangle Institute.

The percentage of vocational students who complete all three academic areas (reading, mathematics, science) of the *HSTW* curriculum increased from just 3 percent in 1988 to 28 percent in 1998. (See sidebar on page 11 for the *HSTW*-recommended curriculum.) Vocational students who completed all three areas had significantly higher achievement than those who did not complete all three areas. (See Table 5.)

The percentage of students who completed the *HSTW* English curriculum increased from 7 percent in 1994 to 39 percent in 1998.

The percentage of students who completed the *HSTW* mathematics curriculum increased from 29 percent in 1988 to 79 percent in 1998. Students' course-taking patterns in mathematics have changed dramatically. The percentage of students who took one or more years of basic or general mathematics decreased between 1994 and 1998, while the percentage of students who completed college-preparatory Algebra I, Algebra II and geometry increased. (See Table 6.)

The percentage of students completing the *HSTW* science curriculum increased from 16 percent in 1988 to 56 percent in 1998. Between 1994 and 1998 there was a decrease in the percentage of students who took general physical science and an increase in the percentage of students who took college-preparatory-level science courses such as biology, chemistry and physics. The most dramatic increase occurred in chemistry. Fifty-seven percent of vocational students reported taking chemistry in 1998, compared with 32 percent in 1994. (See Table 6.)

Table 5

**Average scores of students who completed and did not complete all three academic areas of the *HSTW* curriculum, 1998**

| | Completed the curriculum | Did not complete the curriculum |
|---|---|---|
| Reading | 289 | 273 |
| Mathematics | 312 | 294 |
| Science | 303 | 288 |



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Table 6
**Percentages of students completing mathematics and science courses at *High Schools That Work* sites**

| | 1994 | 1998 |
|---|---|---|
| Basic mathematics | 68% | 12% |
| Basic algebra | 54 | 27 |
| Algebra I | 59 | 78 |
| Algebra II | 38 | 63 |
| Geometry | 49 | 76 |
| General physical science | 64 | 37 |
| Chemistry | 32 | 57 |

## 2. It matters that districts and states increase graduation requirements.

There is a clear connection between vocational students' academic achievement and the courses they take in high school. While SREB states have made progress in improving student achievement, none requires vocational students to complete the *HSTW* curriculum. A survey of SREB states revealed that:

- No SREB state requires all students to complete the *HSTW*-recommended language arts curriculum (four college-preparatory English courses).
- Nine SREB states (Alabama, Arkansas, Delaware, Louisiana, Mississippi, Oklahoma, Texas, Virginia and West Virginia) require all students to complete at least three credits in mathematics, including two at the college-preparatory level, and one state (North Carolina) encourages students to complete such courses.
- Six SREB states (Arkansas, Delaware, South Carolina, Texas, Virginia and West Virginia) have adopted the *HSTW*-recommended science curriculum.
- Six states (Alabama, Georgia, Mississippi, Tennessee, Texas and West Virginia) require students to complete either a career concentration of courses or additional academic courses.

Increasing the number of credits that students must complete in order to graduate from high school improves student achievement. It also is important to require students to take high-level courses. Many schools with higher graduation requirements have gone to block scheduling, which allows students to earn 32 credits instead of the 24 credits available in a traditional schedule of six periods per day.



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SREB analyzed data from 247 of the 444 schools that participated in the 1996 and 1998 *HSTW* Assessments. Of these schools, 130 required between 20 and 23 credits; 117 schools required between 24 and 30 credits. The data show that schools that require more credits for graduation have higher student achievement. These schools exceeded the *HSTW* goals in reading, mathematics and science, while schools that required only 20 to 23 credits for graduation failed to reach the goals. At the 18 *HSTW* sites that used a block schedule and required 24 to 30 credits, including four in mathematics and four in science, scores on the *HSTW* Assessment of student achievement improved 17 points in reading, 21 points in mathematics and 18 points in science between 1996 and 1998. (See Table 7.)

### 3. It matters that students take a mathematics course and a science course in their senior year.

Taking a mathematics course and a science course in grade 12 significantly increases student achievement. (See Table 8.) The SREB report *Reducing Remedial Education: What Progress are States Making?* notes that "students who skip mathematics in their senior year are out of practice when they enter college and, not surprisingly, often need refresher courses." The report also states that evidence from SREB states "suggests that students are less likely to need remedial courses if they complete a core of challenging academic courses in high school and take a high-level mathematics course in the senior year."

*HSTW* stresses that vocational students should take either a mathematics or a science course — or both — in their senior year. *HSTW* sites have made progress in getting

Table 7

**Gains in *HSTW* Assessment scores between 1996 and 1998 at *HSTW* sites with traditional schedules and block schedules**

| *HSTW* Assessment tests | Traditional schedule; 20 to 23 credits required (66 schools) | Block schedule; 20 to 23 credits required (64 schools) | Block schedule; 24 to 30 credits required (99 schools) | Block schedule; 24 to 30 credits required; *and* required curriculum of four mathematics and four science credits (18 schools) |
|---|---|---|---|---|
| Reading gains | 4 points | 5 points | 7 points | 17 points |
| Mathematics gains | 13 points | 13 points | 15 points | 21 points |
| Science gains | 10 points | 11 points | 11 points | 18 points |

Source: NAEP-based *HSTW* Assessment, 1996 and 1998

Table 8
**Vocational students taking mathematics and science in grade 12 at *HSTW* sites, 1998**

| | Took course | | Did not take course | |
|---|---|---|---|---|
| | Percent of students | Average score on *HSTW* Assessment | Percent of students | Average score on *HSTW* Assessment |
| Mathematics | 60% | 302 | 40% | 295 |
| Science | 45 | 297 | 55 | 289 |

vocational students to do so. The percentage of vocational students who took mathematics in grade 12 at *HSTW* sites increased from 41 percent in 1988 to 60 percent in 1998; the percentage who took science in grade 12 increased from 25 percent in 1988 to 45 percent in 1998.

## Advantages of Block Scheduling in Raising the Achievement of Vocational Students

A block schedule enables schools to:

- increase the number of advanced-level mathematics and science courses and enroll students in mathematics and science in their senior year;
- require unprepared ninth-graders to take "double doses" of language arts/reading and mathematics;
- increase opportunities for students to retake failed courses and to graduate with their peers, reducing the likelihood that they will drop out of school;
- improve instruction by giving teachers more time to plan and to engage students in learning;
- get students to complete four credits above the core of academic courses in either an academic or a career concentration; and
- improve relationships between teachers and students. A block schedule contains fewer periods per day, which means that teachers have fewer students to get to know. Also, fewer periods mean fewer class changes and fewer opportunities for students to misbehave.



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Table 9
**Relationship of *HSTW* students' scores and vocational teachers' emphasis on academic skills**

| | Reading | Mathematics |
|---|---|---|
| Teachers emphasized academic skills | 281 | 301 |
| Teachers did not emphasize academic skills | 269 | 294 |

### 4. It matters that vocational teachers stress academic knowledge and skills.

The more often vocational teachers emphasize communication and mathematics skills, the more apt their students are to meet the *HSTW* achievement goals, according to an outside study of the progress of *HSTW* sites between 1996 and 1998. (See Table 9.) Yet little or no progress was made between 1996 and 1998 in increasing the percentage of vocational teachers who often stressed academic content. (See Table 10.)

Over the last four years, *HSTW* staff members have conducted technical assistance visits at more than 300 *HSTW* sites. Classroom observations and interviews with vocational teachers revealed that about one-half of the vocational teachers are not prepared to integrate academic content into vocational assignments. A teacher survey in 1998 revealed that almost one-half of vocational teachers in the *HSTW* network said they needed training in how to integrate reading, writing, mathematics and science content into their courses. During the last three years, less than 10 percent of vocational teachers received more than 20 hours of such training. (See Table 11.)

Table 10
**Percent of *HSTW* students using academic skills to complete vocational assignments**

| | 1996 | 1998 |
|---|---|---|
| Students reported that their teachers often stressed: | | |
| Mathematics skills in completing vocational assignments | 54% | 53% |
| Reading skills in completing vocational assignments | 42 | 43 |
| Writing skills in completing vocational assignments | 44 | 47 |

Table 11
**Vocational teachers who needed and received staff development, 1998**

| | Teachers who needed staff development | Teachers who received more than 20 hours in the last three years |
|---|---|---|
| Reading and writing across the curriculum | 41% | 11% |
| Mathematics content and methods | 36 | 5 |
| Science content and methods | 47 | 5 |
| Revising vocational courses to meet national standards | 45 | 9 |
| New teaching methods for getting students to work harder | 44 | 8 |

Source: 1998 survey of vocational teachers at *HSTW* sites

## 5. It matters that teachers set high expectations and make assignments that engage students.

Students who prepare major research papers, complete short writing assignments, make oral presentations, read several books and use computers to prepare assignments have higher average reading scores than students who lack these experiences. The bad news is that the percentage of students who participated in these learning experiences at *HSTW* sites did not increase between 1996 and 1998.

### Engaging Students in Learning

The 1998 *High Schools That Work* Assessment showed that teachers are doing too little to engage vocational students in active learning.

- Only 51 percent of students read more than two books in 12th-grade English classes.
- Only 11 percent of students made more than two oral presentations on how they solved mathematics problems.
- Only 40 percent of students read more than two books or articles about science.
- Only 43 percent of students used a computer to complete a vocational assignment at least weekly.



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## Expecting More of Vocational Students

The 1998 *High Schools That Work* Assessment showed that teachers expect too little of vocational students.

- Thirty-two percent of vocational students said teachers let them get by without doing the work.
- Fifty-two percent said most courses repeated content they already had learned.
- Fifty-seven percent said they seldom were asked to write in-depth.
- Fifty-seven percent said they were not encouraged to take more mathematics courses.
- Sixty-five percent said they were not encouraged to take more science courses.

Mathematics achievement improved when teachers encouraged students to talk about mathematics and use it in solving real-world problems. Students who reported that they worked in groups to solve difficult mathematics problems — 84 percent of vocational students at *HSTW* sites that participated in the *HSTW* Assessments in 1996 and 1998 — had a higher average score than students who worked alone. Mathematics teachers want to learn how to help more students understand concepts in mathematics. Only 10 percent of mathematics teachers at *HSTW* sites said that, in the last three years, they had received more than 20 hours of staff development in mathematics content and new instructional methods. However, 46 percent said they needed this type of training.

Students who reported that their science teachers required them to write and talk about science had higher scores in science than students who did not write or talk about science. Students who made presentations on science, prepared written reports on scientific topics and conducted scientific experiments once or twice a year had average scores that exceeded the *HSTW* science goal. Students who missed these experiences had average scores that were below the goal. Only 18 percent of science teachers at *HSTW* sites said that, in the last three years, they had received more than 20 hours of staff development to upgrade their content knowledge and to learn new instructional methods. Fifty-five percent said they needed such staff development.

Students who do homework have higher achievement on average than students who do not do homework. Those who do more homework are more likely to meet the *HSTW* achievement goals in reading, mathematics and science, according to a study by the Research Triangle Institute. Vocational students who do homework for vocational courses score higher on the *HSTW* Assessment than those who do no homework. Nearly 60 percent of vocational students in 1998 said they did no homework for vocational classes in a typical week. One indication that low expectations still prevail is the fact that about 60 percent of students at *HSTW* sites in 1998 said most of their courses were not challenging. Nearly 60 percent spent less than an hour reading outside of class per week. Even though teachers often say students do not have time to complete challenging



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assignments outside of class, 69 percent of students said they watched at least two hours of television daily. Students who watched television one hour or less each day had average scores that met the *HSTW* achievement goals in reading, mathematics and science.

## 6. It matters that students receive guidance and advisement.

Student achievement improved between 1996 and 1998 in *HSTW* sites that increased the amount of time available for students to talk with counselors and teachers about planning a program of study, according to a study by the Research Triangle Institute. Achievement in mathematics and science declined in schools that decreased the time that teachers and counselors worked with individual students in developing four-year educational plans. Students at *HSTW* sites who received guidance about postsecondary study had average scores of 282 in reading, 303 in mathematics and 296 in science; students who did not receive this guidance had average scores of 268 in reading, 291 in mathematics and 285 in science.

To raise student achievement, it is essential to have a strong system for guidance and advisement that involves parents as well as students. To get students to complete demanding academic and technical studies, counselors or teacher-advisers need to help each student in setting goals for after high school, developing and pursuing a program of study aligned to those goals, reviewing progress each year, and making necessary adjustments to the program of study.

Early advisement for vocational students and their parents is crucial for four reasons:

- Almost 70 percent of these students plan to continue their studies after high school graduation, despite the widespread perception that they are incapable of meeting high standards.
- Only one-third of these students are proficient enough in reading, mathematics and science to begin college-level studies without first taking many remedial courses.
- Many of these students do not know that they lack the knowledge and skills for further learning. Early guidance will show students the courses they need. Almost 75 percent of vocational students said that, before they began ninth grade, they received no guidance in which courses to take in high school.

### Guidance and Advisement for Vocational Students

The 1998 *HSTW* Assessment of seniors indicated that many schools need to strengthen their guidance and advisement systems.

- Thirty percent of students received no help from a teacher or counselor in developing a program of study for high school.
- Sixty-nine percent said their parents did not meet with them and a school representative to plan a high school program of study.

- A planning meeting will help students and their parents see that a rigorous curriculum in high school is important in opening doors to opportunities after graduation. More parents need to understand the critical role that courses such as geometry, Algebra II, chemistry, physics and college-preparatory English play in preparing students for the workplace and further study.

Schools need to make even more progress in involving parents in the guidance process. Parents should meet with their child and a teacher or counselor each year, beginning when the student is in eighth grade. Parents can reinforce efforts to get students to work hard and meet higher achievement standards. Between 1994 and 1998, the percentage of students at *HSTW* sites who said they met with their parents and a school representative to develop a four-year program of study increased from 19 percent to 31 percent.

As a result of weak guidance systems and low parental involvement, about one-fourth of students at *HSTW* sites in 1998 were dissatisfied with the help they received in setting goals for after high school and in planning programs of study to move them toward these goals. State policies on guidance and advisement can contribute to higher achievement. However, only four SREB states (Mississippi, North Carolina, Tennessee and West Virginia) require schools to assist all students in developing a four-year program of study.

## 7. It matters that students meet curriculum and achievement goals.

Students who meet the *HSTW* curriculum and achievement goals receive the Award of Educational Achievement. (See the *HSTW*-recommended curriculum in the sidebar on page 11.) This award recognizes outstanding student achievement and addresses the 1988 SREB goal of establishing more precise, demanding and measurable standards for vocational students' academic achievement. Nearly 8,000 students — one-fourth of students completing vocational concentrations at *HSTW* sites — earned the award in 1998. These students had average achievement scores that exceeded those of college-preparatory students nationally. (See Table 12.)

It does matter that vocational students meet curriculum and achievement goals. Follow-up studies at colleges and universities in North Carolina, Oklahoma, South Carolina and West Virginia compared the achievement of award recipients with that of other high school graduates. Students who met the *HSTW* curriculum and achievement goals:

- took fewer remedial courses in language arts/reading and mathematics;
- were more likely to return to college after their freshman year; and
- had higher grade-point averages in their freshman year.

Compared with those who didn't receive the award, *HSTW* award recipients are:

- more likely to enroll in further study (83 percent, compared with 56 percent);
- more likely to attend four-year colleges (53 percent, compared with 25 percent);
- less likely to need remedial courses (15 percent, compared with 31 percent); and
- less likely to be unemployed for more than eight weeks during the year after graduation (17 percent, compared with 25 percent).

Table 12
**Achievement of *HSTW* award recipients and nonrecipients compared with college-preparatory students nationally**

| | Percent of all *HSTW* students assessed in 1998 | Average scores | | |
|---|---|---|---|---|
| | | Reading | Mathematics | Science |
| Award recipients | 25% | 304 | 325 | 319 |
| Award nonrecipients | 75 | 268 | 291 | 284 |
| College-preparatory students | Not applicable | 302 | 317 | 307 |

Note: National college-preparatory students are 12th-graders who took the National Assessment of Educational Progress exams and indicated that they were pursuing a college-preparatory curriculum.

The curriculum and achievement goals that contribute to success in college also give high school graduates access to good jobs. Leaders at BellSouth and IBM administered their employment tests to *HSTW* award recipients in selected SREB states. BellSouth found that 90 percent of the award recipients passed the tests, compared with 60 percent of the company's pre-screened applicants. Sixty percent of award recipients passed BellSouth's electricity test, compared with 30 percent of the pre-screened applicants. When IBM administered its test in North Carolina, the company found that award recipients scored at the same level as graduates of community colleges.

If a much larger percentage of vocational students were to earn the Award of Educational Achievement, the impact on the region's productivity and earnings growth could be substantial. The award signifies that high school graduates are ready for the workplace and further education. It means that they have taken the "right courses" in high school and have demonstrated the academic knowledge and skills that college faculty and employers value. Taking steps to increase the number of students who earn the award would be a wise investment for any state or school.

One of SREB's goals in 1988 was to increase the percentage of students who complete a planned sequence of career/technical courses and continue their education within one year of graduation. According to *HSTW* studies of students who completed career/technical sequences, the percentage who enrolled (part time or full time) in postsecondary study within one year of graduation increased from 49 percent in 1989 to 64 percent in 1999. Furthermore, 83 percent of *HSTW* award recipients enrolled in postsecondary study in 1999.



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Table 13
**Postsecondary choices of *HSTW* vocational graduates***

| Type of postsecondary study | Percent of graduates choosing this option |
|---|---|
| Four-year colleges and universities | 47% |
| Community or technical colleges that award associate's degrees | 32 |
| Vocational/technical schools that award certificates | 17 |
| Other (apprenticeships, etc.) | 4 |

* Data are for 3,840 youths who reported in a *HSTW* follow-up study that they had continued their education (part time or full time) within one year of graduating in 1998 from *HSTW* sites.

## 8. It matters that vocational students are held to demanding standards for technical achievement.

Three SREB states (Mississippi, North Carolina and Oklahoma) have ways to measure the technical literacy of vocational students. Technical literacy is the ability to:

- apply academic knowledge and skills to several technical studies;
- read, understand and communicate in the language of the technical field;
- understand technical concepts and principles; and
- use technology to complete projects in a career/technical field.

For example, Oklahoma gives end-of-program exams in broad fields of vocational study (such as manufacturing, agriculture or electronics). That state also requires all high schools and vocational/technical schools to give 12th-graders in programs geared toward a specific occupation either a state-developed occupational exam or a state exam for occupational certification. The state provides schools with reports on their students' performance on the exams. Each school is asked to set goals for improvement. If a school does not improve within three years, it is required to develop a plan for improvement and get it approved by the state.

As a result of legislation passed in 2000, West Virginia will include the *HSTW* Assessment and the Award of Educational Achievement in its plan to improve schools. The assessment and award will be used to determine whether students are taking the right courses and whether the standards are high enough to prepare them for the workplace or postsecondary study. Each high school in the state will receive reports on results of the assessment that they can use in improving what and how students are taught and the guidance and advisement services offered to students.



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*What actions can states take to improve high schools for students enrolled in vocational programs?*

The *High Schools That Work* goal is for public high schools to help more students meet high standards by building educational programs around college-preparatory-level academic studies and challenging career concentrations. The *HSTW* initiative has grown from 28 schools in 13 SREB states in 1987 to 883 schools in 16 SREB states in 2000 (16 percent of the region's public high schools). The participation ranges from 75 percent of public schools in West Virginia to 4 percent in Texas. (See Table 14.)

SREB's long-range goal is not to involve every high school in every state in the *HSTW* network. Rather, the goal is to incorporate the lessons learned from *HSTW* into the state

Table 14
**Numbers and percentages of public high schools using the *High Schools That Work* school-improvement design**

| | Number of high schools in the state | Number of schools in *HSTW* | Percentage of schools in *HSTW* |
|---|---|---|---|
| Alabama | 406 | 35 | 9% |
| Arkansas | 322 | 23 | 7 |
| Delaware | 29 | 7 | 24 |
| Florida | 387 | 39 | 10 |
| Georgia | 344 | 130 | 38 |
| Kentucky | 324 | 98 | 30 |
| Louisiana | 318 | 68 | 21 |
| Maryland | 221 | 24 | 11 |
| Mississippi | 233 | 15 | 6 |
| North Carolina | 387 | 94 | 24 |
| Oklahoma | 469 | 42 | 9 |
| South Carolina | 186 | 34 | 18 |
| Tennessee | 327 | 55 | 17 |
| Texas | 1,162 | 47 | 4 |
| Virginia | 289 | 54 | 19 |
| West Virginia | 157 | 118 | 75 |
| **Total** | 5,561 | 883 | 16 |



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policies, leadership, assessment and support initiatives needed to get 85 percent of vocational students to meet the *HSTW* achievement goals for reading, mathematics and science.

The **first lesson** is that students cannot learn what they are not taught. States can create policies that require all students to complete at least the *HSTW*-recommended curriculum in order to graduate from high school. States should take the following actions:

- Require all students to take at least three mathematics courses in grades nine through 12. Two of these courses should be college-preparatory-level Algebra I, Algebra II, geometry or higher-level mathematics. Six SREB states (Florida, Georgia, Kentucky, Maryland, South Carolina and Tennessee) do not require or systematically encourage all students to complete three mathematics courses, including two college-preparatory-level courses.
- Require all students to complete at least three science courses, including two courses in college-preparatory-level chemistry, physics, applied physics or biology. Ten SREB states (Alabama, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma and Tennessee) do not require three science courses, including two college-preparatory-level courses.
- Require all students to complete four college-preparatory-level courses in English/language arts. No SREB state has this requirement. States need to define the standards for college-preparatory-level English courses, including the number and variety of books and materials to be read and analyzed and the amount of quality writing to be done. States should consult the language arts standards of the Council for Basic Education in crafting their expectations for a college-preparatory curriculum in language arts.
- Require all students to complete at least four courses in either an academic concentration or a career concentration in addition to an upgraded academic core. Ten SREB states (Arkansas, Delaware, Florida, Kentucky, Louisiana, Maryland, North Carolina, Oklahoma, South Carolina and Virginia) do not have this requirement.

The **second lesson** is that students who meet curriculum and achievement goals are better prepared for employment and further learning. States can set accountability standards that require each school to increase annually the percentage of students who meet both curriculum and achievement goals in reading, mathematics and science.

The **third lesson** is that measuring and reporting how well students have learned what they are supposed to learn in vocational classes will increase the quality of vocational programs. States need to develop end-of-program assessments for broad fields of vocational studies (such as manufacturing, agriculture or electronics) to measure whether students can understand major technical concepts; read, comprehend and use technical information; and use mathematical and scientific knowledge and skills to solve real-world problems.

The **fourth lesson** is that well-prepared teachers can teach higher-level academic content to more students. To prepare teachers, states can:

- revise their programs for teacher preparation and certification to teach new vocational teachers how to incorporate academic skills into vocational courses; and

- provide staff development to ensure that all teachers can get students to achieve at higher levels. Funding for staff development should be linked to 1) the more demanding subject matter that teachers are expected to know and teach; 2) the school improvement plan; and 3) the changes to the curriculum and instruction that are necessary for the school to improve student achievement.

The **fifth lesson** is that vocational students achieve at a higher level when they receive early and ongoing information and advice about their postsecondary options and about which high school courses will prepare them for work and further education. States can create policies and leadership initiatives to encourage schools to develop guidance and advisement systems that help students plan and complete challenging programs of study with support from their parents. Loganville High School, a *HSTW* site in Walton County, Ga., has a guidance and advisement system through which all students and their parents meet regularly with teacher-advisers who are trained to mentor small groups of students throughout high school. Because it offered more credits in a block schedule and educated parents about the courses that raise student achievement, the school saw dramatic increases between 1996 and 1998 in the percentages of students who took high-level academic courses. In addition, more Loganville graduates are going to college.

The **sixth lesson** is that some students need extra help to meet higher standards. States can provide funding to help schools in offering summer programs in reading, writing and mathematics; providing extra help before and after school; and creating a schedule that allows time for ninth-graders to take "catch-up" courses in English and mathematics.

The **seventh lesson** is that many high schools need outside support and usable data to become high-performing schools. States can establish teams of experts to assist low-performing schools and schools that are not improving. States also can improve school leaders' use of data from state testing by collecting information about students' school experiences — courses taken, amount of effort required, etc. — and by providing schools with reports that link achievement to the quality of students' educational experiences.

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